Saskatchewan Health

Report of the Saskatchewan Heart Health Survey

Saskatchewan Health
Department of National Health and Welfare
City of Regina Health Department
Saskatoon Community Health Unit
Heart and Stroke Foundation of Saskatchewan
University of Saskatchewan

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REPORT

OF THE

SASKATCHEWAN HEART HEALTH SURVEY

SASKATCHEWAN HEALTH

DEPARTMENT OF NATIONAL HEALTH AND WELFARE

CITY OF REGINA HEALTH DEPARTMENT

SASKATOON COMMUNITY HEALTH UNIT

HEART AND STROKE FOUNDATION OF SASKATCHEWAN

UNIVERSITY OF SASKATCHEWAN

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EXECUTIVE SUMMARY

The Saskatchewan Heart Health Survey was conducted between September, 1989 and February, 1990. It was supported collaboratively by Saskatchewan Health, the Department of National Health & Welfare, the City of Regina Health Department, the Saskatoon Community Health Unit, the Heart and Stroke Foundation of Saskatchewan, and was coordinated by the Saskatchewan Heart and Stroke Foundation Epidemiology Unit, Department of Community Health and Epidemiology, University of Saskatchewan.

Heart disease is the leading cause of death and hospitalization in Saskatchewan. On the average, about 3200 Saskatchewan residents die each year from heart attacks and strokes. Although the death rate from heart disease and stroke in Saskatchewan is lower than the Canadian average and gradually declining, the rate of decline is slower than in most of the other provinces.

The Saskatchewan Heart Health Survey was conducted to determine how many residents are at risk of developing heart attacks and strokes, and to gather information on how much people know about those factors which can lead to heart disease and strokes, e.g. elevated blood pressure, elevated blood cholesterol and smoking.

2,168 Saskatchewan men and women, ages 18 to 74 participated in this survey from across the province. The data were collected by trained survey nurses at a home interview and at a subsequent visit to a survey clinic.

The overall results of the survey are as follows:

Blood Pressure

- Overall 17%, equivalent to 112,000 Saskatchewan adults were found to have high blood pressure.
- About two-thirds of individuals who were found to have high blood pressure were uncontrolled and 1 in 3 was not aware of his/her condition. This was so despite the fact that 71% of the participants had their blood pressure checked within the year prior to the survey.
- The majority of individuals who were interviewed said that high blood pressure was related to what people eat and drink although only one-half recognized the importance of salt and alcohol.

Cholesterol

- About one half of the participants, equivalent to 309,810 Saskatchewan adults had a level of cholesterol in the blood that was above what is considered "desirable" (5.2 mmol/L).
- About 1 in 5 persons, which corresponds to about 118,650 adults had a cholesterol level that is considered to be high (>6.2 mmol/L).
- 97% of individuals who were interviewed had heard about cholesterol. 95% of them were aware that cholesterol is found in foods and most of them believed

that it can affect their health although one half knew of its relationship to heart attack.

- 66% of individuals said that cholesterol is found in eggs, and 1 in 3 said it is present in pork and beef. About 1 in 5 stated that cholesterol is also found in whole milk and cheese.
- Slightly more than half the number of those interviewed said that cholesterol levels can be lowered by reducing the amount of fatty foods they eat. However, less than 1 in 10 identified the value of low fat dairy products and weight reduction as ways of reducing cholesterol level.

Smoking

- 26% of individuals interviewed were regular cigarette smokers (smoking at least one cigarette per day, every day). This is equivalent to 171,385 Saskatchewan adults.
- Most of the regular cigarette smokers were males and females in the youngest age group, ages 18 to 34.
- Among those who identified themselves as regular cigarette smokers, about 1 in 10 smoked more than 25 cigarettes each day, with males smoking more heavily than females.

Alcohol Consumption

- About 1 in 6 individuals had seven or more drinks per week whereas only 3% said they had more than 20 drinks per week.
- Overall, males reported drinking more than females. The heaviest drinkers were in the youngest age group, ages 18 to 34.

Weight

- More than one third of Saskatchewan adults are overweight. Middle-aged and older males and older females had the greatest prevalence of overweight.
- Only 50% of overweight individuals were trying to lose weight, whereas more than 37% of females in the 18-34 age group who had a normal weight were trying to do so.
- The most common methods used to lose weight were exercise and dieting.

Diabetes

- 6% of individuals, equivalent to 39,550 Saskatchewan adults reported having ever been told that they had diabetes.

Physical Activity

- Less than one-half of those interviewed said that they engage in more than three hours of leisure time physical activity each week.
- Younger and middle-aged men were more likely to have an active lifestyle than women in the same age groups.

Family History of Heart Disease

- Nearly one-quarter of all participants have a family history of heart disease, that is a parent or sibling affected before age 60.
- Those participants with a family history of heart disease were twice as likely to have elevated blood cholesterol levels.

Socio-economic and Regional Differences

- In both males and females, lower education was associated with a higher prevalence of elevated blood cholesterol, smoking, obesity and combined risk factors.
- Risk factors for heart disease are as equally prevalent in the rural as in the urban areas of the province.

Awareness of Causes of Heart Disease

- Although over 60% of individuals recognize the association between smoking and heart disease, less than one third recognize the importance of overweight, poor diet, lack of physical activity, high blood pressure and high blood cholesterol.

Individuals With One or More Risk Factors for Heart Disease

- 2 of 3 persons, equivalent to 435,050 in the population ages 18 to 74, had one or more of the major risk factors for heart disease (high blood pressure, elevated cholesterol and cigarette smoking).
- In the younger and middle age groups, more men than women had one or more risk factors.
- 1 in 5 persons, equivalent to 131,835 individuals in the population ages 18 to 74, had two or more major risk factors.
- More males in the younger and middle age groups had two or more of the major risk factors.

Conclusions

The Saskatchewan Heart Health Survey demonstrates that risk factors for cardiovascular disease are widespread in the Saskatchewan population. Adults in the lower socio-economic groups and in certain age and sex groups are more likely to be at risk due to their lifestyle characteristics. Enhanced prevention of cardiovascular disease in Saskatchewan will therefore require a three-pronged approach:

- Comprehensive, multifactorial programs for the population-at-large since most residents are at some risk.
- Effective programs to detect and manage those individuals at high risk for the development of cardiovascular disease.

- Innovative programs to decrease the inequalities that exist in cardiovascular disease and risk in the province.

Unsatisfactory levels of awareness and control of high blood pressure in the population indicate the need for new public and professional strategies to improve the identification and management of this condition. The non-pharmacologic management of high blood pressure requires greater emphasis.

Although decreasing in prevalence, smoking remains a prominent risk factor in the population. Smoking prevention and cessation efforts and the development of appropriate healthy public policy should be enhanced.

Nearly one-half of the Saskatchewan adult population is at increased risk of cardiovascular disease due to elevated blood cholesterol, over one third are overweight and one half have a sedentary lifestyle. A clear national strategy on cholesterol is required which includes population approaches and recommendations for the effective management of high risk individuals. Implementation of the new nutrition recommendations for Canadians is central to action on these interrelated risk factors.

Judicious planning, implementation and evaluation of programs to address these dietary issues, requires a valid data base on the nutritional practices and status of the population. The Nutrition Canada Survey was carried out in 1972. There is a clear need for more current data. Enhanced efforts to encourage and enable increased physical activity in the population is required through public education, individual counselling and appropriate public policy.

There is a need for an organized, systematic approach to enhance the preventive practices of health professionals. This would include cooperative, interdisciplinary programs to enable prevention through primary care practice, as well as approaches to link the primary care sector with the public health system and health promotion initiatives in the community.

It is clear that comprehensive public health measures are required to implement the above strategies. Emphasis on intersectoral coordination and coalition building between government, professional associations, community health and voluntary agencies, business, industry and researchers is of the essence to bring about healthy policies and environmental change necessary to deal with the underlying roots of cardiovascular disease in this province.

PREFACE

The Saskatchewan Heart Health Survey was conducted between September, 1989 and February, 1990. It was supported collaboratively by Saskatchewan Health, the Department of National Health and Welfare, the City of Regina Health Department, the Saskatoon Community Health Unit, the Heart and Stroke Foundation of Saskatchewan and was coordinated by the Saskatchewan Heart and Stroke Foundation Epidemiology Unit, Department of Community Health and Epidemiology, University of Saskatchewan.

This report is intended to provide an overview of the main findings of the survey. The results should serve as a basis for discussion at the provincial and national level leading to the development and implementation of strategies and programs to address this major public health issue.

The survey methodology, the results and the conclusions were reviewed by a Data Interpretation Committee to whom special thanks are due. The composition of the Committee was as follows:

DATA INTERPRETATION COMMITTEE

Dr. Christofer Balram	Principal Investigator, New Brunswick Heart Health Program, Provincial Epidemiologist and Director of Health Promotion and Disease Prevention, Health and Community Services New Brunswick, Fredericton New Brunswick
Dr. Joyce Beare-Rogers	Chief of the Nutrition Research Division, Health Protection Branch, Department of National Health and Welfare, Ottawa, Ontario
D^{r} Madeleine Blanchet	Présidente du Conseil des affaires sociales, Gouvernement du Québec, Sillery, Quebec

Dr. Louis Horlick	Professor of Medicine, University of Saskatchewan, Chairman of the Panel of the Canadian Consensus on Cholesterol, Saskatoon, Saskatchewan
Dr. David McLean (Chairman)	Principal Investigator, Nova Scotia Heart Health Program, and Assistant Dean, Continuing Medical Education, Faculty of Medicine, Dalhousie University, Halifax, Nova Scotia
Mr. Yang Mao	Surveillance and Risk Assessment Division, Bureau of Chronic Disease Epidemiology, Laboratory Centre for Disease Control, Health and Welfare Canada, Ottawa, Ontario
Dr. Eric Nicholls	Regional Advisor, Noncommunicable Disease Prevention, Pan American Health Organization, Washington, D.C.
Dr. Simon Rabkin	Head, Cardiology Unit, University Hospital (Shaughnessy); Professor of Medicine, University of British Columbia, Vancouver, British Columbia
Dr Sylvie Stachenko	Acting Director, Preventive Health Services, Health Services and Promotion Branch, Department of National Health and Welfare, Ottawa, Ontario
Dr. Andy Wielgosz	Head, Division of Cardiology, Ottawa General Hospital Associate Professor of Medicine, University of Ottawa, Ottawa, Ontario

Consultants to the Data Interpretation Committee

Dr. Philip Connelly	Director of the Core Lipid Laboratory, St. Michael's Hospital, Toronto, Ontario
Mr. Mukund Nargundkar	Assistant Director, Special Survey Methods Division, Statistics Canada, Ottawa, ONTARIO

Special thanks are due to the survey nurses, the Provincial Coordinator Ms. Lorraine Khachatourians and to the members of the Planning and Implementation Committees (Appendix II). Information Services Branch, Saskatchewan Health and Westbridge Corporation provided assistance in developing computerized listings of the sampling frame.

The staff at the Survey Data Centre in the Department of Community Health and Epidemiology, University of Saskatchewan, Dr. Leonard Tan and Ms. Liyan Liu, Mr. Mukund Nargundkar of the Special Surveys Division, Statistics Canada, and Dr. Philip Connelly of the Core Lipid Laboratory, University of Toronto all made essential contributions.

Special thanks are also due to Dr. David MacLean, Principal Investigator of the Nova Scotia Heart Health Survey, who kindly shared the protocol used in that study and to Dr. Andres Petrasovits of the Health Promotion Directorate of Health and Welfare Canada for his generous support and encouragement. We wish to acknowledge the assistance of Ms. Ella McLeod, Principal Investigator for the Prince Edward Island Heart Health Survey, and Ms. Cheryl Holtby, Graduate Student, Department of Physical Education, University of Saskatchewan, in conducting the training workshops for the nursing staff.

Finally, it is essential to recognize the contribution of the residents of Saskatchewan, for, without their kind participation, this survey would not have been possible.

INTRODUCTION

In Canada, as in most industrialized countries, non-communicable chronic diseases are the leading cause of premature death and disability. Mortality from cardiovascular disease accounts for about 43% of all deaths (Statistics Canada, 1986a).

Saskatchewan experiences lower death rates from cardiovascular disease than other Canadian provinces. For 1987, the age-adjusted mortality rates for total cardiovascular disease in Saskatchewan for males was 250 per 100,000, while for females it was 155 per 100,000, which is below the national average of 295 and 168 per 100,000 respectively (Nair and Nicholls, 1989). Each year more than 3223 Saskatchewan residents die from cardiovascular disease in the province (Saskatchewan Health, 1986). A major proportion of hospital care days is also associated with cardiovascular disease (Nair and Nicholls, 1989).

Although mortality rates for cardiovascular disease and those of its major components, ischemic heart disease and stroke, have declined in all regions of Canada since the 1960's, Saskatchewan has experienced one of the slower rates of decline (Nicholls et al., 1981, 1986).

Epidemiological, clinical and laboratory studies have identified elevated blood cholesterol, smoking and high blood pressure as the main independent risk factors for cardiovascular disease. These risk factors are either preventable or controllable (Kaplan and Stamler, 1983). The widespread prevalence of these risk factors in Canada has been documented (Department of National Health and Welfare, 1973; Statistics Canada and Department of National Health and Welfare, 1981; Fitness and Amateur Sport Canada, 1983; Nova Scotia Department of Health and Fitness, 1987; Robitaille et al., 1979). It is being increasingly recognized that, even at moderate elevations, increased blood cholesterol and blood pressure levels account for a large proportion of premature cardiovascular disease mortality and morbidity (Rose, 1981).

The value of a multifactorial, integrated approach to prevention of cardiovascular disease and of non-communicable diseases in general, has been recommended by a number of national

and international health policy groups and agencies (Federal Provincial Working Group on the Prevention and Control of Cardiovascular Disease, 1987; World Health Organization 1982,1985,1986; European Atherosclerosis Society, 1987; Resolution of the Thirty-Eight World Health Assembly, 1985).

Since 1987, as part of the Federal/Provincial Heart Health Initiative, the Department of National Health and Welfare, provincial departments of health, local health units, voluntary agencies and universities have collaborated to conduct a series of provincial Heart Health Surveys. The survey in Saskatchewan was supported by Saskatchewan Health, the Health Services and Promotion Branch of the Department of National Health and Welfare, the City of Regina Health Department, the Saskatoon Community Health Unit, and the Heart and Stroke Foundation of Saskatchewan. It was coordinated by the Saskatchewan Heart and Stroke Foundation Epidemiology Unit of the Department of Community Health and Epidemiology, University of Saskatchewan. To allow comparability with the data sets of other provinces which are also doing heart health surveys, the study protocol for the Saskatchewan Heart Health Survey was based on that developed for use in the 1986-87 Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987), with minor modifications.

The purpose of the Saskatchewan Heart Health Survey was to estimate the prevalence and distribution patterns of cardiovascular disease risk factors, including high blood pressure, abnormal levels of blood lipids, smoking and co-morbid conditions, e.g. obesity. The survey also addressed some aspects of knowledge and awareness of factors that lead to cardiovascular disease risk, e.g. dietary factors.

The data processing and analysis was conducted at the Saskatchewan Heart Health Survey Data Centre, established in the Department of Community Health and Epidemiology, University of Saskatchewan, Saskatoon, Saskatchewan. The statistical sample design was prepared by the Special Survey Methods Division, Statistics Canada. The lipid analyses of blood samples were carried out by the Core Laboratory, Lipid Research Clinic, University of Toronto.

A probability sample of 3904 residents of the province, between ages 18 to 74 was obtained from 7 urban centres and 4 census districts from the three strata into which the province had been divided for sampling purposes. Survey methods are described in Appendix I. The questionnaire from the Nova Scotia Heart Health Survey was adapted for use in Saskatchewan and field tested prior to the survey. Estimates of the number of Saskatchewan residents at risk of developing cardiovascular disease due to each risk factor has been calculated from the survey prevalence rate for the risk factor and the most recent census description of the provincial population (Statistics Canada, 1988).

The data were gathered by trained survey nurses at a home interview and at a subsequent visit to a survey clinic (**Table 1**). The survey staff was supervised by Regional Nursing Supervisors who were public health nurses. Provincial supervision was provided by a Survey Coordinator and the Principal Investigator. The survey field operations were carried out between September, 1989, and February, 1990.

In addition to documenting the nature and extent of cardiovascular disease risk in the province, the study demonstrates how the Public Health system, with support of existing resources can effectively carry out epidemiological research which is intrinsic to the establishment of goals, development of public health policy and to the planning and evaluation of intervention programs.

SURVEY RESULTS

Response rate

The survey response rates by age and sex and by stratum are shown in **Tables 2 and 3**. Among the 3904 individuals who were drawn from the Hospital Insurance Registration File on residents of Saskatchewan, 74%, or a total of 2902 were located and invited to participate in the survey. Among these, 2168 (75%) completed the home interview and 1802 (62%) completed both the interview and the clinic components of the survey.

The response rates at the interview and clinic levels were roughly similar for the different age-sex groups, except for the younger males (18 to 34 years) where the response was lower (**Table 2**). There was a difference in the response rates among the three strata (**Table 3**). Stratum II, smaller urban centres, had the highest overall response rates for both completed interview and completed interview and clinic. Response rates for Stratum III, representing the four census districts, were higher than in Stratum I, the four larger urban centres. The two largest urban centres, Sasktoon and Regina, with their surrounding census districts 6 and 11, showed the lowest response rates.

The socio-demographic characteristics of the participants are given in **Table 4**. Nearly 40% of participants had post-secondary education and the vast majority had education beyond the elementary level. About two-thirds of participants reported either full-time or part-time employment at the time of the survey.

Blood pressure

The blood pressure results are shown in **Tables 5 to 10**. The mean values for systolic blood pressure increased with age in both sexes and tended to be higher in males than in females in the younger and middle age groups (18 - 34 and 35-64). A similar pattern is seen in the mean diastolic blood pressure values (**Table 5**).

The prevalence of high blood pressure is also shown in **Table 5**. In this report, high blood pressure is defined as diastolic blood pressure equal to or greater than 90 mm Hg and/or

on treatment, either pharmacological or non-pharmacological (weight control or salt restriction), for the purpose of lowering blood pressure.

Using the above definition, the overall prevalence of high blood pressure was 17%, equivalent to 112,060 individuals in the Saskatchewan population ages 18 to 74. In the younger and middle age groups, the prevalence was higher in males, while in the older age group (ages 65 to 74) the prevalence was higher in females.

High blood pressure awareness, treatment and control status is given in **Table 6**. The criterion used to define "control" was diastolic blood pressure less than 90 mm Hg. By this criterion, about 66% of individuals with high blood pressure were uncontrolled and one in 3 was unaware of his/her condition. The rate of uncontrolled high blood pressure among the treated group was about 36% [19/(34+19)X100].

The vast majority of individuals (98%) had their blood pressure checked sometime in the past. Nearly three-quarters (71%) had their blood pressure checked within the last year, with apparent lower frequency of measurement in the younger males. Doctors and nurses took virtually all measurements, but only one in 3 individuals reported that the actual blood pressure level was given in numbers (**Table 7**).

Among individuals who were ever told by a health professional that they had high blood pressure, nearly 60% reported that they had been prescribed some treatment. At the time of the home interview, over one half of the individuals for whom something had been prescribed were taking drugs, while nearly one third were not following a treatment regimen (**Table 8**).

The specific treatment advice reported to have been given was most often drug therapy. The most common non-pharmacological measures prescribed were weight control (30%) and salt restriction (20%)(**Table 9**).

A majority of individuals appreciated that high blood pressure is related to what people eat and drink. It is worth noting that while 47% recognized salt as a factor, only 3% identified sodium. Alcohol was seen as important by more than half the individuals (**Table 10**).

Lipids

The results of the blood lipid analyses are shown in **Tables 11 to 19**.
All estimates are based on lipid values for 1600 participants who reported fasting 8 hours or more, which represent 89% of clinic attendees.

Table 11 shows that mean total plasma cholesterol level increased with age. In males, the mean values levelled off with age, whereas in females they continued to rise. Mean HDL-cholesterol level was higher in females than in males for each age-sex group.

Mean LDL-cholesterol values closely paralleled total plasma cholesterol, increasing with age in both sexes, higher in men than in women under age 65 (**Table 12**).

Mean triglycerides values were higher among males than among females in the younger and middle age groups. In the older age group, values were nearly identical (**Table 12**).

The cut-off points (**Tables 13 to 19**) which were used to identify the percentage of the population with various degrees of risk, are based on criteria suggested by a number of, generally concordant, expert review panels (The Expert Panel: Canadian Consensus Conference on Cholesterol: Final Report, 1988; The Expert Panel: National Cholesterol Education Program 1988; European Atherosclerosis Society, 1987; The British Cardiac Society Working Group on Coronary Prevention, 1987).

Table 13 shows that 47% of the participants, equivalent to 309,810 individuals in the Saskatchewan population ages 18 to 74, had total plasma cholesterol levels above the "desirable" value of 5.2 mmol/L. This prevalence increased with age and was higher for males than for females in the younger and middle age groups. In the older age group the prevalence was higher among females.

About three in 10 participants, equivalent to 191,160 individuals in the Saskatchewan population ages 18-74, were in the "borderline-high" cholesterol range, i.e. between 5.2 and 6.2 mmol/L.

About one in 5 participants, equivalent to 118,650 individuals in the Saskatchewan population ages 18-74, had total plasma cholesterol levels above 6.2 mmol/L, the range recognized as "high blood cholesterol". This prevalence was highest in older females. In the young and middle age groups the prevalence of "high blood cholesterol" was higher among males.

About 40% of participants, equivalent to 263,670 individuals in the Saskatchewan population ages 18 to 74, had a LDL-cholesterol level above the "desirable" value of 3.4 mmol/L and 17%, equivalent to 112,060 individuals in the population ages 18-74, was in the "high risk LDL-cholesterol" range, i.e. above 4.1 mmol/L. The distribution of individuals over different ranges of LDL-cholesterol associated with increased coronary heart disease risk, for different age-sex groups, was similar to that noted above for plasma cholesterol (**Table 14**).

About one in 10 participants, equivalent to 65,920 individuals in the Saskatchewan population ages 18 to 74, had a HDL-cholesterol under 0.9 mmol/L, a level which has been recognized as a major risk factor for coronary heart disease. This prevalence of "low HDL-cholesterol" was higher in males than in females in all the age-sex groups especially among older males (20%) (**Table 15**).

More than one quarter of participants, equivalent to 184,570 individuals in the Saskatchewan population ages 18 to 74 had a total cholesterol/HDL-cholesterol ratio equal to or greater than 5.0, a level which indicates increased risk for coronary heart disease (Kannel et al, 1984). A greater proportion of males demonstrated this lipid pattern than females in all age groups (**Table 16**).

The distribution of individuals, with all age-sex groups combined, by various levels of LDL-cholesterol and HDL-cholesterol is shown in **Table 17**. Forty-six percent (46% = 100%-54%)

of individuals were at increased risk of coronary heart disease either due to low HDL-cholesterol (less than 0.9 mmol/L), high LDL-cholesterol (equal to or greater than 3.4 mmol/L) or both.

Table 18 shows the distribution of individuals, with all the age-sex groups combined, over various levels of total plasma cholesterol and LDL-cholesterol. Among individuals who were in the "borderline-high" plasma cholesterol range, 31% (9/29) were actually in the "low risk LDL-cholesterol" group. However, for those in the "high risk" plasma cholesterol range, all (17/17) were in the "high risk LDL-cholesterol" category.

Table 19 shows the distribution of individuals, with all age-sex groups combined, over various levels of total plasma cholesterol and HDL-cholesterol. Among individuals within the "desirable" range with respect to total plasma cholesterol, one in 9 (6/53) had a low HDL-cholesterol.

Knowledge and awareness data on cholesterol are given in **Tables 20 to 24** with all age-sex groups combined.

Most individuals had heard about cholesterol (97%) and among these, one in 3 said he/she had it measured. Three-fifths of these individuals reported that they were told their blood cholesterol level and one in 7 was told that his/her cholesterol level was high. A majority of individuals (79%) had some treatment prescribed or advice given and in almost half (45%), dietary measures were recommended (**Table 20**).

Among those who had heard about cholesterol, a large majority of them (95%) were aware that cholesterol is found in foods and, among these, most believe (98%) that it can affect health. Two thirds of individuals believed that cholesterol is found in eggs and about one third recognized that it is present in pork and beef. One participant in 5 realized that cholesterol is also found in whole milk and cheese (**Table 21**).

The presence of cholesterol in the blood was recognized by a large percentage of individuals (89%) who reported having heard about cholesterol. Among those aware of its presence in the blood, virtually everyone (99%) was aware that blood cholesterol affects health; about half (49%) knew of its relationship to heart attacks (**Table 22**).

Among those who had heard about cholesterol, when asked what measures an individual may take to lower his or her cholesterol level, nearly three quarters said "eat foods with less cholesterol" and about one half said "reduce intake of fatty foods". One in 8 recognized the value of low fat dairy products and one in 10 the value of weight reduction (**Table 23**).

On a related issue, fat consumption was viewed by a large majority of individuals (86%) as affecting health. However, less than half of these individuals recognized the relationship of fat consumption to heart disease, elevated blood cholesterol and overweight (**Table 24**).

Smoking

The prevalence of regular cigarette smoking was 26%, equivalent to 171,385 individuals in the Saskatchewan population ages 18 to 74. The prevalence was higher among males and females in the younger and middle age groups. The highest rate, 32%, was among males 18-34 years of age (**Table 25**).

Among regular cigarette smokers, about one in 10 was a heavy smoker (over 25 cigarettes per day). The prevalence of heavy smoking was highest for middle age males and was considerably higher among males than females for each age group (**Table 26**). The mean number of cigarettes smoked per day by regular cigarette smokers was 18; again the highest consumption occurred in middle-aged males.

Alcohol consumption

The percent distribution of alcohol consumption shows that, on the average, about one in 6 individuals had seven or more drinks per week and that only 3% had 20 or more drinks per week. Males reported drinking more than females in all age-sex groups. In both sexes, the

prevalence of heavier drinking was highest in the younger age group and declined with age (**Table 27**).

Weight

The Body Mass Index (BMI) is recognized as an appropriate indicator to categorize the weight of individuals with respect to possible health risks (Bray, 1985). The mean values of BMI by age-sex groups and the frequency distributions according to BMI levels are given in **Table 28**. Higher mean BMI values were observed in middle age and older males and in older females.

Using the Canadian Guidelines for Healthy Weights (Department of National Health and Welfare, 1988), about one in 3 individuals in the population ages 18 to 74 had a weight which for height is associated with excess mortality and morbidity from a variety of chronic diseases (BMI equal to or greater than 27). This prevalence was higher among middle age and older males and in older females.

Similar findings to body mass index were seen using the waist/hip ratio as a measure of obesity, that is, middle-aged and older males, and older females had the highest percentage of ratios indicating overweight (**Table 29**). Most striking, however, is the significantly greater proportion of middle-aged men with a high ratio (73%) compared to younger males (30%).

About one in 6 individuals in the normal weight category (BMI under 25) was trying to lose weight. This was much more common among females in the younger and middle age groups. Among overweight individuals, that is those with BMI over 27, one half were trying to lose weight. This was more common among females than among males (**Table 30**).

Overall, one in 3 individuals, ages 18 to 74, were trying to lose weight. Exercise was the most common method used to lose weight (66%) followed closely by dieting (65%). Use of diet pills for weight loss was minimal (1%) (**Table 31**).

Diabetes

Six percent of participants, equivalent to 39,550 individuals in the Saskatchewan population ages 18 to 74, reported ever been told that they have diabetes. Among the 124 individuals in the sample who were aware, 36 reported having been diagnosed at age 30 or younger (**Table 32**).

Physical activity

Less than half the population engages in more than 3 hours per week of physical activity in their spare time. Young and middle aged men are more likely than women to have such an active lifestyle while no gender difference is seen in the older age group (**Table 33**).

Family History

Nearly one-quarter of all participants have a family history of ischemic heart disease, that is have at least one parent or sibling who had angina or a myocardial infarction prior to age 60. Of those participants with a family history of ischemic heart disease, 30% had an elevated plasma cholesterol (equal to or greater than 6.2 mmol/L) compared to only 14% of those with a negative family history. This difference is especially notable in the middle aged females and older men (**Table 34**).

Socioeconomic and regional differences

Table 35 shows that, in males and females, lower education was associated with higher age-standardized prevalence of elevated blood cholesterol, smoking, obesity and multiple risk factors. There was no clear association between educational level and the prevalence of high blood pressure.

An examination of the prevalence of major risk factors in large cities, small cities and rural areas revealed no clear trend (**Table 36**). In general, the level of risk factors was lower in females than males. The age-standardized prevalence of high blood pressure was lower in Saskatoon and Regina for both males and females, as was the prevalence of overweight in women. Rural males had increased prevalence of multiple risk factors and overweight.

Combined risk factors for cardiovascular disease

Information on awareness of the causal risk factors in the development of heart disease is given in **Table 37**. Over 60% of individuals recognized smoking as a risk factor for heart disease. More than one third identified overweight, poor diet, high blood cholesterol or high blood pressure. Stress and lack of exercise were reported as causes by 37% and 35% of individuals, respectively.

Table 38 gives the percentage of the population with 0,1,2, or 3 of the major risk factors for cardiovascular disease: smoking, high blood pressure and elevated blood cholesterol. Two out of 3 participants, equivalent to 435,050 individuals in the Saskatchewan population ages 18 to 74, had one or more major risk factors. This prevalence of combined risk factors increased with age and was higher among males than among females in the younger and middle age groups.

One in 5 participants had two or more of the major risk factors, equivalent to 131,835 individuals in the Saskatchewan population ages 18 to 74. This prevalence of combined risk factors increased substantially between the younger and the middle age groups for both sexes. While in the younger and middle age group this prevalence was higher among males than among females, there was little gender difference in the older age group.

Characteristics of those participants who completed the home visit only were compared with those who completed both the home and clinic components (**Table 39**). Those who attended both phases of the survey tended to smoke less and have higher levels of education and total household income but had a slightly lower prevalence of high blood pressure. No difference was demonstrated with respect to the prevalence of sedentary lifestyle.

Among individuals with elevated blood cholesterol (equal to or greater than 5.2 mmol/L) the most prevalent risk cofactor in the younger and middle aged groups is smoking. Among the elderly with elevated blood cholesterol, high blood pressure becomes the more prevalent comorbid condition (**Table 40**).

DISCUSSION OF RESULTS

Survey response

The overall location rate for individuals whose names were drawn from the Health Insurance Registration File (HIRF) of Residents of Saskatchewan was less than anticipated. Although the HIRF is updated annually, some individuals had moved from their registered address or died since the most recent update. The failure to locate individuals was especially frequent among males ages 18 - 34. Yet, since virtually all residents in the province are registered, every resident 18 to 74 years of age had some probability of selection under the sampling scheme used. The probability weights were not adjusted for double listings, nevertheless, this is not believed to have an appreciable effect on the tabular estimates.

The overall response rate for the survey and the response patterns by age-sex groups compare favourably with those observed in national and international studies (Department of National Health and Welfare, 1973; Statistics Canada and Department of National Health and Welfare, 1981; Nova Scotia Department of Health and Fitness, 1987; The WHO-MONICA Project,1988; Health and Community Services, New Brunswick, 1989). This was largely due to the fact that the community health professionals who conducted the survey enjoyed a high degree of credibility and trust in the community.

To assess the extent to which non-response may have influenced the results, a comparison is made in **Table 39** of selected socio-demographic characteristics and health behaviours between clinic attendees and those individuals who participated in the home interview, but did not come to the clinic. This Table shows that those who did not attend the clinic were more likely to be regular cigarette smokers and to have lower levels of education and income although they were somewhat less likely to have high blood pressure. There were no appreciable differences between the two groups with respect to sedentary lifestyle.

The difference observed between these two groups with respect to smoking prevalence and educational level, confirms a similar observation reported by the Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987) and the New Brunswick Heart Health Survey (Health and Community Services, New Brunswick, 1989). Thus, it seems

plausible to assume that individuals who did not attend the clinic are generally more likely to have cardiovascular disease risk factors. For this reason, the prevalence data reported here may, in fact, underestimate the actual prevalence of risk factors in the population.

High blood pressure

In this survey, the presence of high blood pressure was defined as follows: (1) a diastolic blood pressure equal to or greater than 90 mm Hg (the mean of four measurements made at two separate visits) and/or (2) being on medication and/or salt restriction and/or weight reduction for the treatment of high blood pressure.

The Saskatchewan Heart Health Survey provides more reliable prevalence rates of high blood pressure than other surveys where blood pressure was measured at one visit only (Department of National Health and Welfare, 1973,1989; Statistics Canada and Department of National Health and Welfare, 1981; Fitness and Amateur Sport Canada, 1983).

From a clinical perspective a diastolic blood pressure reading falling into the lower end of the range of "90 mm Hg and over" does not necessarily imply that an individual would be labelled hypertensive or that drug treatment is indicated. However, longitudinal studies have shown that blood pressure measurement on only one occasion can predict the occurrence of subsequent high blood pressure (Rabkin et al., 1982; Robitaille et al.,1983), cardiovascular disease (The Pooling Project Research Group, 1978) and death from any cause (Johansen et al., 1987). Thus, the criteria used in this report to define high blood pressure are judged to be appropriate to determine the health of the community in that they provide a measure of the increased cardiovascular disease risk due to elevated blood pressure (Blackburn et al., 1985; Nova Scotia Department of Health and Fitness, 1987; Department of National Health and Welfare, 1989).

The prevalence of high blood pressure in Saskatchewan is lower than that reported in the Nova Scotia Heart Health Survey (Nova Scotia Department of Health and Fitness, 1987), in the New Brunswick Heart Health Survey (Health and Community Services, New Brunswick,

1989), and in the Canadian Blood Pressure Survey (Department of National Health and Welfare, 1989).

The prevalence of high blood pressure was higher in the older age group, where issues of compliance as well as the risks and benefits of treatment are still uncertain (Larochelle et al., 1986). Although the prevalence in the younger age group was much lower, it is worth noting the non-compliance with treatment was likely to be more of a problem than with other age groups.

It is of concern that among individuals with high blood pressure, 66% were not controlled and that one in 3 was unaware of his/her condition. This was so despite the fact that 71% of the participants had their blood pressure checked within the year prior to the survey.

These findings suggest that the management and/or compliance with prescribed therapy is far from optimal. This is supported by the finding that, among individuals who were told that they had high blood pressure and were prescribed a treatment or program, an appreciable proportion of them was not following the treatment or program at the time of the survey.

Factors which may be associated with the lack of control of high blood pressure appear to be the inappropriate information given to patients concerning their blood pressure and the relative infrequent use of non-pharmacological approaches to management of the condition.

Lipids

According to recent scientific consensus conferences, the presence of high levels of total blood cholesterol and LDL-cholesterol, as well as a low HDL-cholesterol level and a high ratio of total cholesterol to HDL-cholesterol are strongly related to the development of atherosclerosis in humans and therefore warrant remedial action (The Expert Panel: Canadian Consensus Conference on Cholesterol:Final Report, 1988; The Expert Panel: National Cholesterol Education Program 1988; European Atherosclerosis Society, 1987; The British Cardiac Society Working Group on Coronary Prevention, 1987; Consensus Development Conference, 1985). The data from the Saskatchewan Heart Health Survey

permit an assessment of the population risk in terms of these different plasma lipid fractions and their combinations.

The Canadian Consensus Conference on Cholesterol (1988) recommended as a goal a mean total blood cholesterol level of 4.9 mmol/L in the general population. By this criterion, the data from the Saskatchewan Heart Health Survey indicate that, for middle age and older groups, a reduction of about 12% in the mean blood cholesterol level from current levels is required.

MacMahon and Peto (1988) have estimated, from a review of intervention trials, that a reduction in the mean blood cholesterol level of 10% should result in a reduction of between 10 to 30% in total coronary heart disease beyond the current rate of decline. The feasibility of achieving this goal in Canada has been examined by Little and Horlick (1989) who conclude that the estimated reduction in coronary heart disease would be even greater, if accompanied by the reduction and control of other risk factors such as smoking and high blood pressure.

LDL-cholesterol is recognized as the major atherogenic fraction (Grundy, 1986; Brown and Goldstein, 1986). However, for purposes of case-finding and initial evaluation in practical settings, analysis of total blood cholesterol is more readily available. The latter is a good proxy for risk since total blood cholesterol is closely correlated with LDL-cholesterol by virtue of the fact that about 70% of the cholesterol in the plasma is found in LDL-cholesterol.

There are an estimated 309,810 Saskatchewan residents who are at increased risk due to elevated plasma cholesterol (above 5.2 mmol/L) who would likely benefit from having it reduced. Among these, 118,650 are at high risk (above 6.2 mmol/L) and probably require some form of medical intervention.

The overall prevalence of elevated plasma cholesterol, LDL-cholesterol and low HDL-cholesterol over various levels of risk reported here, matches very closely that observed in

the Nova Scotia Heart Health Survey (MacLean and Petrasovits, 1988) and the New Brunswick Heart Health Survey (Health and Community Services, New Brunswick, 1989).

Clinical trials have shown that lowering LDL-cholesterol in men with high levels decreases the incidence of coronary heart disease (Mishkel, 1989; Langille and Lavigne, 1988). In terms of this fraction, 263,670 individuals in the Saskatchewan population, ages 18 to 74, may be considered to be above "desirable" levels (equal to or greater than 3.4 mmol/L) and 112,060 are probably in the "high risk LDL-cholesterol" range (equal to or greater than 4.1 mmol/L).

A low HDL-cholesterol concentration, defined as a level below 0.9 mmol/L (35 mg/dL)) is associated with a significant increase in coronary heart disease risk in both men and women (Gordon et al. 1977; Goldburt and Medalie, 1979; Grundy et al. 1989). By this criterion there are about 65,920 individuals in the province at risk due to "low HDL-cholesterol". Hygienic means (e.g. smoking cessation, aerobic exercise, weight control) have been recommended to raise "low HDL-cholesterol" levels; however, drug therapy specifically to raise HDL-cholesterol in patients without high blood cholesterol levels is not advocated (Grundy et al., 1989).

The higher prevalence among middle age men of risk levels for total plasma cholesterol and the lipoprotein fractions LDL and HDL-cholesterol, together with evidence from epidemiological intervention studies and recommendations from review panels, suggest that they would constitute a priority for intervention (The Expert Panel: Report of the National Cholesterol Education Program, 1988; Toronto Working Group on Cholesterol Policy, 1989).

The statistical cross-tabulations of prevalence for different lipid fractions (**Tables 18 and 19**) have implications for the definition of practical guidelines for detection and evaluation of abnormal lipid patterns after a total plasma cholesterol value has been obtained. In particular, the data allow an assessment of the value of determining the LDL and HDL-cholesterol following determination of total plasma cholesterol.

In evaluating the usefulness of measuring LDL and HDL-cholesterol in individuals who were found to have a high risk total cholesterol, that is greater than 6.2 mmol/L, note that 100% (17/17) of individuals in this group had an elevated LDL-cholesterol (above 3.4 mmol/L) and 6% (1/18) also had a low HDL-cholesterol (less than 0.9 mmol/L). Therefore, there appears to be little benefit to be gained by measuring LDL and HDL-cholesterol in these individuals **(Tables 18 and 19)**.

By contrast, in the moderate risk range for total plasma cholesterol (between 5.2 and 6.2 mmol/L), 31% (9/29) of individuals had a normal LDL-cholesterol (less than 3.4 mmol/L) and 90% (26/29) had HDL-cholesterol greater than 0.9 mmol/L. This suggests that, among these individuals, it is worth measuring LDL and HDL-cholesterol as a means of avoiding their entry into a treatment program **(Tables 18 and 19)**.
Among individuals with a "normal" total plasma cholesterol level of less than 5.2 mmol/L, about 6% (3/54) had an above normal LDL-cholesterol (greater than or equal to 3.4 mmol/L) and about 11% (6/53) had a high risk HDL-cholesterol (less than 0.9 mmol/L). This would indicate some benefit of measuring LDL-cholesterol and HDL-cholesterol in this group of individuals with normal total plasma cholesterol, particularly when other risk factors are present**(Tables 18 and 19)**.

If the results of studies conducted in the United States are a guide to the Canadian situation, bringing about control of individuals at high risk from elevated blood cholesterol will require addressing the lack of awareness on the part of physicians of the importance of elevated blood cholesterol as a risk factor, and the apparent lack of action to manage it at levels associated with moderate risk (Shucker et al.,1987a, 1987b). In Saskatchewan although 70% of physicians appear to recognize hypercholesterolemia as a risk factor for coronary heart disease, only 22% feel very effective at modifying it. Over 80% state that they perform a blood cholesterol test routinely on initial patient check-ups (Reeder et al. 1989).

Most individuals are aware of the existence of cholesterol and that it may have an impact on health. However, specific knowledge of its link to diet and specific health outcomes is lacking. Although there are many factors which can influence blood cholesterol, in most

individuals with moderate elevations, diet is the most overriding one (Blackburn, 1979). This would suggest the need for public education programs which speak directly to the need to reduce total and saturated fat intake, as well as practical guidance for individuals on how to achieve it.

The large numbers of individuals in Saskatchewan who are at "moderate" to "high" risk due to elevated blood cholesterol, parallels what has been reported in other Canadian jurisdictions (Nova Scotia Department of Health and Fitness, 1987; Health and Community Services, New Brunswick, 1989) and in the United States (Sempos et al., 1989). There is a growing and justified concern that identification of large numbers of individuals as being at risk, coupled with availability of new therapies and the lack of reliability of routine laboratory lipid measurements, could lead to overmedicalization and add to the health care costs without yielding significant benefit to the improvement of the health status of the population (Toronto Working Group on Cholesterol Policy, 1989). Care is needed to avoid the potential harmful consequences of labelling individuals at risk or causing undue anxiety through inappropriate programs of public screening (Haynes et al., 1978; Wagner et al., 1984).

Undue medicalization may, in part, be averted through appropriate professional and patient education programs, cautious treatment guidelines for the use of drugs and by health professionals making more use, when appropriate, of non-pharmacological approaches as sole or adjuvant means to control risk factors such as elevated blood pressure and high blood cholesterol (Canadian Consensus Conference on Non-Pharmacological Approaches to the Management of High Blood Pressure, 1989; The Expert Panel: Canadian Consensus Conference on Cholesterol: Final Report, 1988; Little and Horlick, 1989).

In addressing the above concerns, it is important to keep in perspective that the identification of a large segment of the population as being at risk need not, per se, result in undue impact on health care costs, since for the majority of these individuals, little more would be required than reinforcing the hygienic, general population health promotion-type of approach focusing on appropriate lifestyle changes. (European Atherosclerosis Society, 1987).

Smoking

Due to its widespread prevalence, smoking makes a major contribution to cardiovascular disease mortality and morbidity as well as to other chronic diseases (e.g. lung cancer, chronic obstructive pulmonary disease).

Overall, the smoking rate in Saskatchewan in the present survey is lower than the national average and less than that found in the province in 1986 (Department of National Health and Welfare, 1988). Furthermore, smokers in Saskatchewan appear to smoke fewer cigarettes per day than they do in provinces such as New Brunswick (Health and Community Services New Brunswick, 1989).

It is of special significance to note the higher prevalence of smoking among males and females in the younger age group. Among regular smokers it is also worth noting the higher prevalence of heavy smoking among middle age and senior males and females. Clearly there is a need for effective programs to prevent smoking and to promote smoking cessation.

Alcohol

Alcohol is being increasingly recognized as a significant factor for high blood pressure, even at moderate levels of consumption (Beilin, Puddey, Vandongen, 1987). Although the reliability of estimating alcohol consumption through interviews may be open to question, the data from this survey suggest that Saskatchewan residents may consume less alcohol per week than residents in other provinces such as New Brunswick (Health and Community Services New Brunswick, 1989). Still, a sizeable proportion of individuals in Saskatchewan are consuming alcohol at a level that is not consistent with good cardiovascular health.

Weight

There is some controversy as to whether overweight is an independent risk factor for coronary heart disease. However, its role in the expression of high blood pressure, diabetes, hypercholesterolemia and in the development of other chronic conditions, such as

osteoarthritis, is well recognized (Bray, 1985; Roncary, 1983). There is evidence that overweight as a risk factor is more significant the earlier in life it occurs (Rabkin, 1977). The prevalence of overweight in Saskatchewan is widespread, especially among middle age and older males and females. Clearly females are more conscious about weight control than males. It is of particular concern that, among young and middle age females, who were of normal weight, over 33% were trying to lose weight. Males are less concerned with weight control as evidenced by the fact that less than 40% of those who were obese were trying to control their weight. The dramatic increase in waist/hip ratio in middle-aged men indicates considerable changes in the distribution of body fat in that group. These patterns suggest the need to make the public aware of what constitutes a healthy weight without creating undue anxiety (Department of National Health and Welfare, 1988).

With respect to measures currently used to lose weight, it is advisable for education programs to emphasize appropriate dietary habits (e.g. not skipping meals) and the value of exercise. Weight control programs do not seem to be utilized to any great extent. This suggests the possibility of exploring opportunities for self-help and mutual aid groups to assist individuals to understand what a healthy weight is and how to obtain it.

Diabetes

Diabetes is recognized as an independent risk factor for heart disease and is especially significant for women after middle age (Kannel and McGee, 1979). The prevalence of awareness of this condition in this survey is similar to that reported in another study (Statistics Canada and Department of National Health and Welfare, 1981). It is believed that there is a sizeable group of diabetics who are not aware of their condition (Wigle, 1986). The prevalence of diabetes reported here may be an underestimate of the true prevalence.

The small number of individuals in the sample who were aware of their diabetic status does not lend itself to a breakdown by age and gender. Since the prevalence of disease increases with age, thus it can be presumed that awareness and control programs targeting the middle age and older age groups should be a priority.

Physical activity

There is evidence that vigorous physical activity is a preventive factor for heart disease (Paffenbarger et al., 1978). Exercise helps to control other risk factors (e.g. weight) and it can be beneficial for overall health (Powell et al., 1987).

The interview instrument used in this survey permits the estimation of the percentage of individuals who exercise vigorously during their spare time. It does not measure the level of exercise associated with the participant's occupation.

A large segment of the population in Saskatchewan leads a "sedentary" lifestyle which has been taken to be less than 3 hours of spare time physical activity per week. This is consistent with data from the Canadian Fitness Survey (Stephens et al., 1986). Programs which incorporate measures aimed at increasing the physical activity of Saskatchewan residents are warranted. Appropriately designed approaches should be considered for the females in the younger and middle age groups and for both sexes in the older age group.

Family History

Family history of coronary heart disease in first-degree relatives before age 60 is well recognized as a risk factor for the development of the disease in individuals (Nora et al., 1980; Hayden, 1989). The results of this survey demonstrate that individuals with a positive family history are twice as likely to have an elevated plasma cholesterol (equal to or greater than 6.2 mmol/L). This reinforces the recommendation those individuals with a strong family history of coronary heart disease should be a priority group for plasma cholesterol screening (The Expert Panel. The Canadian Consensus Conference on Cholesterol, 1988).

Socio-economic and regional differences

In Canada, the inverse relationship between income and cardiovascular mortality (Wigle, Mao, 1980) and education and risk factor prevalence (Millar, Wigle, 1986) has previously been reported. In so far as the level of education may be considered a proxy for socio-economic status, the results of the Saskatchewan Heart Health Survey indicate the importance of the latter as a determinant of cardiovascular disease risk. This is particularly

the case for young men and women with lower levels of education with respect to most of the risk factors considered here. No clear regional differences were seen for major risk factors. This argues for the need to target, on a province-wide basis, appropriate policies and programs to these groups if the health of the population is to be improved.

Combined risk factors

It is well recognized that significant elevation of any one of the major cardiovascular disease risk factors can pose a risk to health. For example, the risk of heart attack within a seven year period for middle age men with a plasma cholesterol of 6.2 mmol/L is doubled, in comparison to the risk for middle age men with plasma cholesterol of 5.2 mmol/L. However, it is less well appreciated that combined, moderate elevations of several risk factors may also confer a significant increase of coronary heart disease risk. For example, cigarette smoking about doubles the risk of heart disease at all levels of plasma cholesterol (Stamler, 1986).

In Saskatchewan, it is estimated that over 435,050 individuals ages 18 to 74 have one or more of the major cardiovascular disease risk factors. This is generally consistent with the estimates obtained in other risk factor surveys where the combined prevalence of risk factors was calculated (Department of National Health and Welfare, 1988). It is worth noting, however, that the combined risk factor prevalence in Saskatchewan (66%) is lower than that reported in the Nova Scotia Heart Health Survey (71%) (Nova Scotia Department of Health and Fitness, 1987) and the New Brunswick Heart Health Survey (68%) (Health and Community Services, New Brunswick, 1989).

CONCLUSIONS

The Saskatchewan Heart Health Survey demonstrates that risk factors for cardiovascular disease are widespread in the Saskatchewan population. Adults in the lower socio-economic groups and in certain age and sex groups are more likely to be at risk due to their lifestyle characteristics. Enhanced prevention of cardiovascular disease in Saskatchewan will therefore require a three-pronged approach:

- Comprehensive, multifactorial programs for the population-at-large since most residents are at some risk.
- Effective programs to detect and manage those individuals at high risk for the development of cardiovascular disease.
- Innovative programs to decrease the inequalities that exist in cardiovascular disease and risk in the province.

Unsatisfactory levels of awareness and control of high blood pressure in the population indicate the need for new public and professional strategies to improve the identification and management of this condition. The non- pharmacologic management of high blood pressure requires greater emphasis.

Although decreasing in prevalence, smoking remains a prominent risk factor in the population. Smoking prevention and cessation efforts and the development of appropriate healthy public policy should be enhanced.

Nearly one-half of the Saskatchewan adult population is at increased risk of cardiovascular disease due to elevated blood cholesterol, over one third are overweight and one half have a sedentary lifestyle. A clear national strategy on cholesterol is required which includes population approaches and recommendations for the effective management of high risk individuals. Implementation of the new nutrition recommendations for Canadians is central to action on these interrelated risk factors.

Judicious planning, implementation and evaluation of programs to address these dietary issues, requires a valid data base on the nutritional practices and status of the population. The Nutrition Canada Survey was carried out in 1972. There is a clear need for more current data. Enhanced efforts to encourage and enable increased physical activity in the population is required through public education, individual counselling and appropriate public policy.

There is a need for an organized, systematic approach to enhance the preventive practices of health professionals. This would include cooperative, interdisciplinary programs to enable prevention through primary care practice, as well as approaches to link the primary care sector with the public health system and health promotion initiatives in the community.

It is clear that comprehensive public health measures are required to implement the above strategies. Emphasis on intersectoral coordination and coalition building between government, professional associations, community health and voluntary agencies, business, industry and researchers is of the essence to bring about healthy policies and environmental change necessary to deal with the underlying roots of cardiovascular disease in this province.

TABLE 1

DATA GATHERED AT THE HOME INTERVIEW

AND AT THE CLINIC VISIT

I HOME INTERVIEW

A. Individual and household demographic data

B. Knowledge and awareness of:

1. High blood pressure
2. Cholesterol
3. Dietary factors (fat, salt)
4. Heart disease and stroke

C. Health behaviours

1. Smoking
2. Alcohol consumption
3. Physical activity
4. Compliance with prescribed treatment for high blood pressure and elevated blood cholesterol

D. Family history of cardiovascular disease

E. Rose Questionnaire of cardiovascular disease symptoms

F. Two blood pressure measurements

II CLINIC VISIT

A. Two blood pressure measurements

B. Height and weight

C. Hip and waist girths

D. Fasting blood sample

E. Self-administered psychosocial questionnaire

TABLE 2

NUMBER IN THE POPULATION, SAMPLE

DRAWN FROM FILE AND RESPONSE BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Number in population (a)	139,104	154,431	35,711	136,055	153,084	40,786	659,171
Sample size of survey (b)	1318	516	247	1066	507	250	3904
Number located (i.e. invited to participate) (c)	821	439	222	739	441	240	2902
%(d)	62	85	90	69	87	96	74
Home interview completed No.	577	343	158	581	347	162	2168
%(e)	70	78	71	79	79	68	75
Home interview and clinic visit completed No.	462	304	148	443	298	147	1802
%(f)	56	69	67	60	68	61	62

(a) Estimate of population as of June 1, 1989, from Statistics Canada.

(b) Number of names drawn from the Health Insurance Register files for survey.

(c) Total number of individuals who were located using information from the Saskatchewan Health Insurance Register data files and were invited to participate in the SHHS.

(d) Percentage of those located among those sampled.

(e) Percentage who completed the home interview among those located.

(f) Percentage who completed the home interview and clinic among those located.

TABLE 3

NUMBER LOCATED AND

RESPONSE BY SAMPLE AREA

Sample Area	Located	Home Interview Completed		Home Interview and Clinic Completed	
	Number	Number	%	Number	%
Stratum I					
Saskatoon	597	426	71	272	46
Regina	565	412	73	361	64
Moose Jaw	86	71	83	64	74
Prince Albert	101	74	73	66	65
Stratum II					
Estevan	88	71	81	64	73
Weyburn	81	65	80	59	73
North Battleford	79	68	86	63	80
Stratum III Census District Number					
1	321	250	78	242	75
6	339	241	71	180	53
11	335	244	73	197	59
15	310	246	79	234	75
Total	2902	2168	75	1802	62

TABLE 4

SOCIODEMOGRAPHIC CHARACTERISTICS OF

PARTICIPANTS IN THE HOME INTERVIEW (a) (b)

	Percent %
Education (highest level completed) (c)	
Elementary	2
Secondary	59
Post Secondary	39
Total	100
Employment Status:	
Full time	52
Part time	12
Unemployed/laid off	3
Retired	11
Homemaker	14
Student	5
Other	3
Total	100

(a) Unweighted data.

(b) Total No. in the sample: 2168

(c) Education: elementary = grades 0 - 6
secondary = grades 7 - 12
post secondary = grades > 12

TABLE 5

MEAN VALUES OF BLOOD PRESSURE (a)

5th AND 95th PERCENTILES

AND PREVALENCE OF HIGH BLOOD PRESSURE (b)

BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Systolic B.P.							
Mean (mmHg)	123	128	138	112	121	139	123
Percentiles (c)	107-144	109-150	109-173	96-127	100-149	112-172	101-151
Diastolic B.P.							
Mean (mmHg)	78	83	81	70	78	80	77
Percentiles (c)	62-92	70-96	65-98	57-84	63-94	63-98	61-94
Prevalence of HBP %	10	26	33	3	18	37	17

(a) Based on the mean of four blood pressure (B.P.) measurements obtained at two separate visits (n=1745) and on the basis of two BP measurements obtained at one home visits (N=348). Total number = 2093.

(b) High Blood Pressure (HBP) is defined as diastolic B.P. $\geq$90 mmHg and/or on treatment (pharmacological or non-pharmacological: weight control and/or salt restriction).

(c) 5th and 95th percentiles.

Table 7

PERCENT RESPONSES TO QUESTIONS ON BLOOD PRESSURE MEASUREMENT BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Ever had B.P. checked	94	99	99	99	100	99	98
Had B.P. checked within last year (a)	56	64	82	77	77	91	71
B.P. was checked (a)							
by doctor	61	67	61	69	71	78	67
by nurse	28	27	34	27	24	22	27
Actual value of B.P. measurement provided (a)	33	36	34	38	35	36	36

(a) Among those individuals who reported having their B.P. ever checked (Total No. in the sample: 2126).

Table 8

PERCENT RESPONSES TO QUESTIONS

ON TREATMENT FOR HIGH BLOOD PRESSURE

(ALL AGE AND SEX GROUPS COMBINED)

	Percent %
Ever told by health professional that they have HBP	24
Any treatment or program prescribed (a)	58
Currently not following a treatment or program (b)	30
Currently taking drugs (b)	53

(a) Among those individuals who were ever told that have HBP (Total No. in the sample: 505).

(b) Among those individuals who were told that they had HBP and for whom something was prescribed (Total No. in the sample: 290).

Table 9

SPECIFIC ADVICE GIVEN TO THOSE WITH HIGH BLOOD PRESSURE FOR WHOM TREATMENT OR PROGRAM WAS PRESCRIBED (a) (b) (c)

(ALL AGE AND SEX GROUPS COMBINED)

Advice	Percent %
Take drugs only	41
Drugs and other treatment	33
Salt free diet	20
Watch the weight	30
Avoid stress	16
Start exercise program	10
Cut down on alcohol	3

(a) Total No. in the sample: 290

(b) Excluding responses 'to cut down or stop smoking' and the residual category 'other'.

(c) Unprompted responses, more than one response allowed.

Table 10

PERCENT AWARE OF DIETARY FACTORS RELATED

TO HIGH BLOOD PRESSURES (a) (b)

(ALL AGE AND SEX GROUPS COMBINED)

Factor	Percent %
Alcohol	55
Salt/salty foods	42
Fats	44
Cholesterol	29
Fried foods	20
Sugar/sweet foods	17
Coffee/caffeine	20
Pork	6
Meats generally	5
Specific meat other than pork	2
Saturated fats	10
Sodium	3

(a) Among those who said that HBP is related to what people eat or drink (Total No. in the sample: 1311).

(b) Unprompted responses, more than one response allowed.

Table 11

MEAN VALUES FOR PLASMA CHOLESTEROL

AND HDL CHOLESTEROL BY AGE AND SEX (a)

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Plasma Cholesterol							
Mean mmol/L	4.79	5.57	5.55	4.62	5.39	6.13	5.21
(Number in the sample)	(410)	(281)	(137)	(380)	(266)	(126)	(1600)
% (b)	89	92	93	86	89	86	89
HDL -Cholesterol							
Mean mmol/L	1.18	1.16	1.16	1.39	1.39	1.39	1.28
(Number in the sample)	(405)	(272)	(135)	(376)	(262)	(123)	(1573)
% (b)	88	89	91	85	88	84	87

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

(b) Percentage among those who attended clinic.

Table 12

MEAN VALUES FOR LDL CHOLESTEROL AND TRIGLYCERIDES BY AGE AND SEX (a)

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
LDL-Cholesterol							
Mean mmol/L	2.91	3.57	3.54	2.70	3.28	3.90	3.21
(Number in the sample)	(399)	(267)	(134)	(376)	(259)	(122)	(1557)
% (b)	86	88	91	85	87	83	86
Triglycerides							
Mean mmol/L	1.52	1.93	1.86	1.16	1.54	1.88	1.59
(Number in the sample)	(410)	(281)	(137)	(380)	(266)	(126)	(1600)
% (b)	89	92	93	86	89	86	89

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

(b) Percentage among those who attended clinic.

Table 13

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY PLASMA CHOLESTEROL LEVELS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<5.2 mmol/L	70	38	31	78	48	15	53
5.2-6.2 mmol/L	22	38	45	18	30	32	29
≥6.2 mmol/L	8	24	24	4	22	53	18
Total	100	100	100	100	100	100	100
(Number in the sample)	(410)	(281)	(137)	(380)	(266)	(126)	(1600)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

Table 14

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY LDL CHOLESTEROL LEVELS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<3.4 mmol/L	75	39	40	83	59	28	60
3.4-4.1 mmol/L	19	37	36	12	23	29	24
4.1-4.9 mmol/L	5	18	18	4	11	33	12
≥4.9 mmol/L	1	6	6	1	6	10	4
Total	100	100	100	100	100	100	100
(Number in the sample)	(399)	(267)	(134)	(376)	(259)	(122)	(1557)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

Table 15

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY HDL CHOLESTEROL LEVELS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<0.9 mmol/L	15	14	20	4	5	3	10
≥0.9 mmol/L	85	86	80	96	95	97	90
Total	100	100	100	100	100	100	100
(Number in the sample)	(405)	(272)	(135)	(376)	(262)	(123)	(1573)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

Table 16

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY CHOLESTEROL TO HDL RATIO BY AGE AND SEX

RATIO	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<3.5	30	13	13	58	38	17	32
3.5 - 4.9	45	40	40	33	43	46	41
≥5.0	25	48	47	9	19	37	28
Total	100	100	100	100	100	100	100
(Number in the sample)	(404)	(272)	(135)	(376)	(262)	(123)	(1572)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

Table 17

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY HDL CHOLESTEROL AND LDL CHOLESTEROL LEVELS

(ALL AGE AND SEX GROUPS COMBINED)

	HDL CHOLESTEROL		TOTAL
	<0.9 mmol/L	≥0.9 mmol/L	
LDL Cholesterol			
<3.4 mmol/L	6	54	60
3.4-4.1 mmol/L	3	21	24
4.1-4.9 mmol/L	1	11	12
≥4.9 mmol/L	0	4	4
Total	10	90	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more (Total No. in the sample: 1557).

Table 18

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY PLASMA CHOLESTEROL AND LDL CHOLESTEROL LEVELS

(ALL AGE AND SEX GROUPS COMBINED)

	PLASMA CHOLESTEROL			TOTAL
	<5.2 mmol/L (<200 mg/dL)	5.2-6.2 mmol/L (200-240 mg/dL)	≥6.2 mmol/L (≥240 mg/dL)	
LDL Cholesterol				
<3.4 mmol/L	51	9	0	60
3.4-4.1 mmol/L	3	18	3	24
4.1-4.9 mmol/L	0	2	10	12
≥4.9 mmol/L	0	0	4	4
Total	54	29	17	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more (Total No. in the sample: 1557).

Table 19

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY PLASMA CHOLESTEROL AND HDL CHOLESTEROL LEVELS

(ALL AGE AND SEX GROUPS COMBINED)

	PLASMA CHOLESTEROL			TOTAL
	<5.2 mmol/L	5.2-6.2 mmol/L	≥6.2 mmol/L	
HDL Cholesterol				
<0.9 mmol/L	6	3	1	10
≥0.9 mmol/L	48	26	17	90
Total	53	29	18	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more (Total No. in the sample: 1572).

Table 20

PERCENT RESPONSES TO QUESTIONS

ON CHOLESTEROL MEASUREMENT

(ALL AGE AND SEX GROUPS COMBINED)

	Percent %
Ever heard about cholesterol	97
Ever had blood cholesterol measured (a)	37
Was told what blood cholesterol level was (b)	59
Ever told by health professional that blood cholesterol was high (a)	14
Any treatment prescribed or advice given (c)	79
On diet to lower blood cholesterol (c)	45

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 2111).

(b) Among those who reported having had blood cholesterol measured (Total No. in the sample: 716).

(c) Among those who were ever told that blood cholesterol was elevated (Total No. in the sample: 264).

Table 21

PERCENT AWARE OF FACTORS RELATED TO

CHOLESTEROL IN FOOD

(ALL AGE AND SEX GROUPS COMBINED)

Factor	Percent %
Cholesterol is found in food (a)	95
Cholesterol in foods affects health (b)	98
Cholesterol is found in: (c)	
Eggs	60
Pork	37
Beef	32
Whole milk	20
Cheese	20
Poultry	17
Seafood	4

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 2112).

(b) Among those reporting cholesterol is found in blood (Total No. in the sample: 2006).

(c) Unprompted responses, more than one response allowed.

Table 22

PERCENT AWARE OF FACTORS RELATED TO CHOLESTEROL IN BLOOD

(ALL AGE AND SEX GROUPS COMBINED)

Factor	Percent %
Cholesterol is found in blood (a)	89
Blood cholesterol affects health (b)	99
Blood cholesterol affects health by: (b) (c)	
Heart attack	49
Hardening the arteries	67
Increasing blood pressure	28
Stroke	21

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 2111).

(b) Among those reporting cholesterol is found in blood (Total No. in the sample: 1864).

(c) Unprompted responses, more than one response allowed.

Table 23

PERCENT RESPONSES TO QUESTION: "WHAT CAN A PERSON DO TO LOWER HIS/HER BLOOD CHOLESTEROL LEVEL" (a) (b)

(ALL AGE AND SEX GROUPS COMBINED)

Response	Percent %
Eat less fatty foods	45
Eat foods with less cholesterol	71
Exercise regularly	39
Use low fat dairy products	13
Lose weight	11
Take prescribed medication	6
Control stress and fatigue	5

(a) Among those reporting having heard about cholesterol (Total No. in the sample: 2111).

(b) Unprompted responses, more than one response allowed.

Table 24

PERCENT AWARE OF HEALTH PROBLEMS RELATED TO FAT CONSUMPTION

(ALL AGE AND SEX GROUPS COMBINED)

Problem	Percent %
Fat consumption affects health	86
Health problems related to fat consumption: (a) (b)	
Elevated blood cholesterol	44
Heart disease	47
Overweight	47
High blood pressure	29
Hardening of the arteries	20

(a) Among those who reported that fat consumption affects health (Total No. in the sample: 1865).

(b) Unprompted responses, more than one response allowed.

Table 25

PREVALENCE OF REGULAR CIGARETTE SMOKING (a) BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Prevalence %	32	26	18	32	20	12	26
Survey of smoking habits, Saskatchewan 1986 (b) %	35	32	21	31	30	10	30

(a) Regular cigarette smoking is defined as smoking at least one cigarette per day, every day.

(b) Department of National Health and Welfare. Smoking Behaviour of Canadians, 1986, By W.J. Millar. Ottawa: Minister of Supply and Services, 1988.

Table 26

PERCENT DISTRIBUTION OF NUMBER OF CIGARETTES SMOKED PER DAY AMONG REGULAR CIGARETTE SMOKERS BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
1-10 cigs/day	24	7	40	34	38	34	26
11-25 cigs/day	67	72	44	64	54	57	64
26+ cigs/day	9	21	16	2	8	9	10
Total	100	100	100	100	100	100	100
(Number in the sample)	(180)	(88)	(27)	(189)	(70)	(20)	(574)
Mean number of cigarettes per day, among regular cigarette smokers.	18.2	23.8	17.8	14.3	15.9	17.5	18.1

Table 27

PERCENT DISTRIBUTION OF ALCOHOL CONSUMPTION BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
No alcohol in last year	9	16	25	8	18	36	15
<7 drinks/week	66	61	59	86	78	59	71
7-20 drinks/week	18	17	12	5	4	4	11
≥20 drinks/week	7	6	4	0	1	1	3
Total	100	100	100	100	100	100	100
(Number in the sample)	(577)	(343)	(158)	(581)	(347)	(162)	(2168)

Table 28

BODY MASS INDEX (a): MEAN VALUES AND PERCENT DISTRIBUTION BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
BMI Mean	25.6	27.5	26.5	24.2	26.1	27.3	26.0
Percent distribution of BMI:							
<20	5	3	2	13	7	4	6
20-25	45	23	31	52	42	32	39
25-27	20	22	26	13	12	16	17
≥ 27	30	52	41	22	38	48	37
Total	100	100	100	100	100	100	100
(Number in the sample)	(444)	(301)	(145)	(438)	(296)	(144)	(1768)

(a) BMI = weight (kg)/height^2 (m) calculated from clinic measurements.

Table 29

PERCENT DISTRIBUTION OF
WAIST TO HIP RATIO

RATIO	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
High (a)	30	73	82	24	37	62	44
Low	70	27	18	76	63	38	56
Total	100	100	100	100	100	100	100
(Number in the sample)	(445)	(302)	(147)	(439)	(296)	(144)	(1773)

(a) High waist to hip ratio is defined as $\geq$ 0.9 for males and $\geq$ 0.8 for females, according to the Canada Fitness Survey, 1981.

Table 30

NUMBER AND PERCENTAGE OF INDIVIDUALS TRYING TO LOSE WEIGHT BY LEVEL OF BMI BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
BMI (a)							
<25 %	12	13	4	37	27	20	23
(Number in the sample)	(220)	(76)	(49)	(284)	(146)	(51)	(826)
25-27 %	23	24	16	62	42	34	33
(Number in the sample)	(90)	(64)	(33)	(57)	(36)	(23)	(303)
≥27 %	34	39	29	68	73	44	50
(Number in the sample)	(132)	(158)	(60)	(94)	(112)	(67)	(623)

(a) BMI = weight (kg)/height^2(m) - calculated from clinic measurements.

Table 31

PERCENT RESPONSES TO QUESTIONS RELATED TO

TRYING TO LOSE WEIGHT BY AGE AND SEX

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Presently trying to lose weight	20	26	17	42	47	33	33
Trying to lose weight by: (a) (b)							
Dieting	58	70	60	65	67	54	65
Exercise	79	67	45	75	57	55	66
Skipping meals	22	12	16	18	10	19	15
Weight control programs	1	1	0	10	17	13	9
Diet pills	1	0	0	1	1	2	1
(Number in the Sample)	(117)	(88)	(27)	(243)	(161)	(52)	(688)

(a) Among those trying to lose weight.

(b) Unprompted responses, more than one response allowed.

Table 32

PREVALENCE OF AWARENESS (a) OF DIABETES

	Percent %
Percent Aware (b)	6

(a) Awareness is defined as ever being told that you have diabetes.

(b) Among the 124 participants who were aware, 36 were diagnosed at age ≤30 years, 71 at age >30 years and 17 were unsure of age at diagnosis.

Table 33

PERCENT DISTRIBUTION OF PHYSICAL ACTIVITY IN SPARE TIME

Average Number of Hours Per Week	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
< 1 hour/week	14	26	30	17	25	31	22
1 - 3 hours/week	26	27	29	30	36	27	29
> 3 hours/week	60	47	42	53	39	42	49
TOTAL	100	100	100	100	100	100	100
(Number in the Sample)	(577)	(343)	(158)	(581)	(347)	(162)	(2168)

Table 34

PERCENTAGE WITH ELEVATED CHOLESTEROL(a) OF THOSE WITH AND WITHOUT FAMILY HISTORY OF MI OR ANGINA(b) BY, AGE & SEX

	Male			Female			Total
Family History	18-34	35-64	65-74	18-34	35-64	65-74	
Absent	8	21	21	4	14	53	14
Present	10	33	31	6	41	53	30
(Number in the sample)	(410)	(281)	(137)	(380)	(266)	(126)	(1600)

(a) Elevated cholesterol is defined as plasma cholesterol ≥ 6.2 mmol/L.

(b) Before age 60 in father, mother or siblings.

Table 35

AGE STANDARDIZED PREVALENCE OF MAJOR RISK FACTORS
BY LEVEL OF EDUCATION AND SEX (a)(b)

	Male		Female		
Risk Factor	Secondary or less	Post-Secondary	Secondary or less	Post-Secondary	TOTAL
Elevated blood chol.(c)	52	44	45	38	-
HBP(d)	20	20	13	14	-
Smoking(e)	33	19	29	19	-
One or more of the above	74	63	66	55	-
Over-Weight(f)	46	34	36	26	-
Total no. in sample	679	396	652	438	2165

(a) Age standardization to Population of Canada 1986 Census, Statistics Canada

(b) Secondary or less: grades 0 - 12
Post-Secondary: grades >12

(c) Blood cholesterol $\geq$ 5.2 mmol/L

(d) Diastolic blood pressure $\geq$ 90 mm Hg and/or treatment

(e) Regular cigarette smoking

(f) Body mass index $\geq$ 27

Table 36

AGE STANDARDIZED PREVALENCE OF MAJOR RISK FACTORS
BY LEVEL OF URBANIZATION

Risk Factor	Male			Female		
	Large Cities	Small Cities	Rural	Large Cities	Small Cities	Rural
Elevated blood chol.(c)	49	45	51	41	40	43
HBP(d)	16	24	21	9	13	17
Smoking(e)	26	26	28	24	30	23
One or more of the above	68	67	71	58	60	63
Over-Weight(f)	39	39	45	27	35	34
Total no. in sample	419	173	486	419	176	495

Large Cities: Saskatoon and Regina
Small Cities: Moose Jaw, Prince Albert, Estevan, Weyburn and North Battleford
Rural: Stratum III (Census District # 1, 6, 11, 15).

Table 37

PERCENT AWARENESS OF CAUSES OF HEART DISEASE

(ALL AGE AND SEX GROUPS COMBINED)

Cause reported	Percent %
Smoking	63
Excess stress	37
Overweight	48
Poor diet	35
Lack of exercise	35
High blood cholesterol	30
High blood pressure	14
Heredity	29
Overwork	8
Excess fats	14
Excess salt	7
Foods with high cholesterol	9
Hardening of the arteries	5

(a) Unprompted responses, more than one response allowed

Table 38

PERCENT DISTRIBUTION OF INDIVIDUALS WITH 0, 1, 2 or 3 MAJOR RISK FACTORS (a) BY AGE AND SEX

	MALE			FEMALE			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
0 risk factors	47	19	18	53	32	8	34
1 risk factor	38	53	47	38	49	56	46
2 risk factors	15	26	32	8	18	33	19
3 risk factors	1	2	3	1	1	3	1
TOTAL	100	100	100	100	100	100	100
(Number in the sample)	(406)	(275)	(136)	(376)	(261)	(125)	(1579)

(a) Risk factors defined as follows:

Elevated plasma cholesterol ≥5.2 mmol/L (200 mg/dL).
High blood pressure: DBP ≥90 mmHg and/or on treatment.
Regular cigarette smoking.

Table 39

PERCENT OF PARTICIPANTS WITH DIFFERENT CHARACTERISTICS AMONG THOSE WHO COMPLETED THE QUESTIONNAIRE ONLY, OR COMPLETED THE QUESTIONNAIRE AND ATTENDED THE CLINIC (a)

Characteristic	Completed the Questionnaire only (b) %	Attended the Clinic (c) %
High Blood Pressure	13	16
Regular Cigarette Smoker	37	24
Sedentary lifestyle (d)	49	49
Post-secondary education and over	37	39
Income over $25,000	49	58

(a) Unweighed data

(b) Number in the sample: 366

(c) Number in the sample: 1802

(d) Exercise less than 3 hours per week

Table 40

PREVALENCE OF SMOKING(a) AND HIGH BLOOD PRESSURE(b) AMONG INDIVIDUALS WITH ELEVATED BLOOD CHOLESTEROL(c) BY AGE AND SEX

Risk Factor	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Smoking Only	33	19	13	32	14	8	19
High Blood Pressure Only	12	21	29	6	21	30	20
Smoking and high blood pressure	3	3	4	2	2	4	3
Total no. in sample	122	172	94	82	135	106	711

(a) Regular cigarette smoking

(b) Diastolic Blood pressure $\geq$ 90 mm Hg and/or treatment

(c) Blood cholesterol $\geq$ 5.2 mmol/L

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APPENDIX I: METHODOLOGY

Population

The target population for the survey was the non-institutionalized, adult population of Saskatchewan (ages 18 to 74), with the exclusion of those living on Indian reserves, institutions (e.g.: prisons, hospitals), military camps and census district 18 (the far north). The province of Saskatchewan has a total population of 1,007,000 of which 659,171 are 18 to 74 years of age (Statistics Canada, 1989). The unemployment rate in Saskatchewan is higher than the national average and it is subject to seasonal fluctuations. The economy of the province consists of agriculture, mining, oil and natural gas extraction, forestry, energy, fishing, and other related industries.

Sampling frame

The sampling frame was the computerized list of residents of the province enroled in the Health Insurance Registration File (HIRF) of Saskatchewan Health. Medicare is universally available in the province and practically all residents are registered on the HIRF. The HIRF was established with the introduction of universal medicare in the province. Each individual record has a unique identifier with name, age, sex and address. Individuals born in the province are enroled in medicare at birth.

Sample selection

The province has 18 census districts. For logistical reasons, census district 18 (the far north) was not included in the sample frame. There are nine urban centres as defined by Statistics Canada. For the purposes of the sampling design, the province was divided into three strata. Stratum I was made up of the larger urban centres and Stratum II consisted of the smaller urban centres and Stratum III consisted of the 17 rural census districts.

All four urban centres in Stratum I (Saskatoon, Regina, Prince Albert, Moose Jaw), three of the five urban centres in Strata II (Estevan, Weyburn, North Battleford), and four of the census districts in stratum III (C.D. 1, 6, 11, 15) were represented in the sample. To select individuals within these areas, all individuals in the HIRF were stratified into six age and sex strata (males and females 18 - 34, 35 - 64, 65 - 74). From each stratum, a systematic random

sample was selected using random starts and appropriate sampling ratios. The latter were chosen so as to obtain the expected number participants required in each selected area.

The target sample size was 2,100 individuals. To accommodate failure-to-locate and non-response, a total sample of 3,904 individuals in the age-sex groups and areas required was drawn from the HIRF. Of these 2,902 were located and invited to participate in the survey.

The larger sample allocation for the younger age groups (Table 2) was to obtain an even distribution of individuals expected to fall into the high risk group categories (e.g.: high blood pressure and elevated blood cholesterol) among age-sex groups. This pattern of allocation tends to yield higher precision for the prevalence estimates in the younger age groups which might constitute a priority for intervention.

Staff training

Interviewing training sessions were carried out for the survey nurses by Ms. Ella McLeod, Director of Nursing, Department of Health and Social Services, Prince Edward Island. Training was also provided on blood pressure measurements, measurement of height and weight, waist and hip girths, and drawing of blood samples. An interviewer's manual, developed by Statistics Canada was used as a basis for training in administration of the questionnaire. Training sessions also covered matters related to survey data flow, quality control and all phases of data capture.

Survey Procedures

Following an official letter of invitation the prospective participant was telephoned by one of the survey nurses. The intent of the survey was explained, the individual's participation requested and a data arranged for a home visit. An informed written consent was obtained from the participant at the beginning of the home visit. Six attempts were made to contact each individual before considering him/her unable to be located.

Survey nurses administered the questionnaire at a home visit. During this visit, 2 blood pressure measurements were taken and the self-administered psychosocial questionnaire left

with the participant. At a second clinic visit less than two weeks later, fasting blood samples and anthropometric measurements were taken. The psychosocial questionnaire was collected. Blood samples and completed questionnaires were sent the same day to the Survey Coordinator. In Regina, blood samples were sent directly to Toronto, and questionnaires to Saskatoon. Blood samples from all other sites were sent from Saskatoon to Toronto.

Questionnaire

The Saskatchewan Heart Health Survey questionnaire was adapted for use in Saskatchewan from the Nova Scotia instrument (Nova Scotia Department of Health and Fitness, 1987). Although the core questions remained unchanged, questions in the areas of diet and physical activity were modified. To assess general dietary patterns several questions were especially developed for the survey. Questions on physical activity were adapted from the Canada Fitness Survey (Fitness and Amateur Sport Canada, 1983). They assessed the number of hours per year an individual had spent engaged in physical activities which ranged from walking for exercise and golf to cross-country skiing and jogging.

Supplementary sections were added to the questionnaire. Questions on family history were adapted from those of the Lipid Research Clinics Coronary Primary Prevention Trial (Lipid Research Clinics, 1984). Current symptoms of angina and intermittent claudication were identified using the Rose questionnaire (Rose, G.A, et al., 1982). A question on ethnic affiliation from the 1986 Census of Canada (Statistics Canada, 1986b) was included. A separate, self-administered questionnaire to measure psychosocial variables associated with risk of coronary heart disease was constructed from existing instruments by Dr. Carl D'Arcy, Applied Psychiatric Research, University of Saskatchewan. Other than family history, the findings of these supplementary sections, will not be presented here but will be presented in future publications.

Blood pressure

The survey staff was trained for the measurement of blood pressure using a videotape developed by Dr. George Fodor, Faculty of Medicine, Memorial University of Newfoundland, following the Guidelines of the Canadian Coalition for High Blood Pressure (1988).

Standardization for identification of the Korotkoff sounds was carried out using a tape and manual developed for the Hypertension Detection and Follow-up Program, School of Public Health, University of Texas. Standard mercury sphygmomanometers, 15-inch stethoscopes and appropriate size cuffs were used.

The subject rested quietly for a minimum of five minutes and had been asked not to eat or smoke for a minimum of thirty minutes prior to measurement. The participant's right arm was held at the level of the heart. The maximum inflation level was determined prior to the actual measurement of blood pressure. The first and fifth Korotkoff sounds were recorded for the systolic and diastolic pressures respectively. For sounds which continued to zero mm Hg the fourth Korotkoff sound was recorded. The pulse was also recorded.

A total of four blood pressure readings were taken: at the beginning and end of the home interview, and at the beginning and end of the clinic visit. The blood pressure data presented in this report are based on the mean of these four measurements. For participants who failed to attend the clinic, the mean blood pressure values are based on the two measurements taken at the home visit.

Height and weight

Weight was measured using a balance beam scale. Participants were dressed in normal indoor clothing without shoes. Height was measured against a wall, using a walled tape measure and a fixed square, with participants standing without shoes on a hard surface. For purposes of this report the height and weight data were converted to Body Mass Index values [weight(kg)/height(m)^2] at the Saskatchewan Heart Health Data Centre.

Hip and waist girth measurements

To measure waist girth, the tape was positioned horizontally at the level of noticeable waist narrowing. The measurement was made at the end of a normal expiration. When there is an indeterminate waist, girth is taken at the estimated lateral level of the twelfth or lower floating rib. For hip girth, the tape is positioned around the hips at the level of the

symphysis pubis and the greatest gluteal protuberance. Measurements are recorded to the nearest centimetre.

Blood samples

Participants had been asked to fast for twelve hours. At the clinic, the time actually fasted was recorded. Two venous blood samples were obtained in 15 ml Lavender stopper Vacuutainer tubes containing sodium EDTA. The filled tubes were promptly mixed by inverting eight times. The tubes were labelled and stored at 4 degrees C pending centrifugation which was done within two hours of the taking of the blood specimen. The plasma from the two tubes was transferred by Pasteur pipette to a plastic, screw-cap tube. Three mL of plasma were then placed in a separate, graduated tube containing the enzyme aprotinin. This sample will be used for future plasma apolipoprotein measurement. The remaining plasma was kept in the original screw-cap tube, and the pelleted red cells combined in a third tube. The red cells will be used for future analysis of plasma apolipoprotein DNA polymorphism. All three tubes were labelled, dated and shipped on ice packs for lipid analysis at the Lipid Research Centre at the University of Toronto. This Laboratory is standardized to the Lipid Research Clinics methodology.

The lipid fractions determined were: total plasma cholesterol, triglycerides, high density lipoprotein (HDL) cholesterol, and low density lipoprotein (LDL) cholesterol. Lipid determinations were made according to the Lipid Research Clinics Laboratory Manual and met the requirements for the standardization and quality control described elsewhere (National Heart, Lung and Blood Institute, 1974). The plasma samples were not examined for lipemia. The apolipoprotein and DNA polymorphism analyses will be performed by the Lipid Research Clinic, University of Toronto under a separate research funding and the results published at the future.

Quality control

The survey nurses returned after 5 weeks for a one-day workshop to monitor adherence to survey procedures and reinforce the standardized methods. For every fiftieth participant at the clinic, blood pressure, height and weight, and waist and hip measurements were repeated

by a second nurse to verify the information obtained by the survey staff. A duplicate blood sample was taken from every fiftieth participant to allow an independent quality control check of the analyses done at the Lipid Research Clinic. Values for duplicate total cholesterol, HDL, LDL and triglyceride analyses were within allowable ranges (all differences between duplicates were less than 4 times the difference between the overall mean of the original tests and overall mean of the replicates).

Ethical provisions

To ensure confidentiality, each participant was given a unique identifier, which precluded the need to have name and address on the survey instruments. A separate file was established to link name and address to the identifier for purposes of control of survey information and for referral to care services if necessary. Responsibility for the custody of this file and other survey information rests with Saskatchewan Health.

All participants were given a written record of their blood pressure measurements. Those with diastolic blood pressure above 90 mm Hg were advised to see a doctor according to the Referral Guidelines of the Canadian Hypertension Society and of the Canadian Coalition for High Blood Pressure (Canadian Coalition for High Blood Pressure, 1988).

Each participant was sent a letter with the blood lipids results. Those 18 to 29, with plasma cholesterol levels greater than 4.6 mmol/L, and those ages 30 to 74 with plasma cholesterol levels greater than 5.2 mmol/L were advised to see their physician.

The survey protocol was submitted and approved by the University of Saskatchewan Advisory Committee on Ethics in Human Experimentation.

Data processing

The home interview and the clinic data were edited by the survey coordinator who verified the completeness of the data. The data were then sent to the Saskatchewan Heart Health Data Centre at the University of Saskatchewan. The Centre consolidated the information from the home interview, the clinic, including the results from the laboratory analyses, in a

computerized master file. Questionnaire data were entered with the SAS/FSP program on an IBM microcomputer. The questionnaire and laboratory data were transferred to the mainframe (VAX) computer system at the University of Saskatchewan, merged and analyzed using SAS 5.0.

To keep track of the interview and clinic data sets and to ensure completeness of data collection, control ledgers were independently kept by the survey coordinator.

The Saskatchewan Heart Health Data Centre checked all the data for inconsistencies and missing items. The inconsistencies were rectified and, whenever possible, the missing data were collected by recontacting the participants.

Probability weights, which are the inverse of the probabilities of inclusion of respondents in the sample, were calculated from the sample design and added to the computerized master file. Separate weights were used for information collected at the home interview and for information collected at the clinic. Non-response to the home interview or to the clinic was accommodated by adjusting the weights of the respondents. Unless otherwise stated, all the tabular estimates presented in this report are weighted.

APPENDIX II
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SASKATCHEWAN HEART HEALTH SURVEY 1989-1990

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